PLANNING THE
APPRENTICESHIP PROG

Department of Education
Office of Vocational and Adult Education

PLANNING THE APPRENTICESHIP PROGRAM

Instructor Training Module #2

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the text may not be the form of the word with which you are familiar.

Words/Terms

1. *Analysis Coordinator*   Individual responsible for coordinating the Analysis Committee
2. *Analysis Committee*   Group responsible for conducting an occupational analysis
3. *Analysis Sheet*   Forms used in the analysis of worker skills and knowledges
4. *Apprenticeable Occupation*   An occupation for which apprenticeship training is suitable
5. *Apprenticeship Committee*   Group responsible for administration of an apprenticeship program
6. *Goals*   Statements of desired long-range program results
7. *Knowledges*   What the job holder must understand in order to perform the job
8. *Motivation*   That which prompts a person to act
9. *Objectives*   Means for the achievement of goals
10. *Occupational Analysis*   A systematic study of an occupation to obtain information needed to plan program
11. *Plan*   A formal document describing anticipated results and strategies for their achievement
12. *Planning*   The determination of what results are to be accomplished and how to achieve these
13. *Psychomotor*   Controlled physical/muscular behavior
14. *Sponsor*   The organization that has final responsibility for an apprenticeship program
15. *Standards*   Descriptions of apprenticeship program characteristics and procedures
16. *Strategy*   A means or procedure for achieving results
17. *Technological Change*   Changes in the basic way work is performed
18. *Work Activities*   Those tasks required to be performed
19. *Work Processes*   A classification of work activities

1. How To Use This Booklet

What Is The Series About?

…ubjects instruction is an essential part of every
…ship program. It is the program component
…hich apprentices are taught the background
… range of applications of associated technical
…ch as mathematics, science and safety. Related
… usually takes place in a classroom, after the
…rk is over. Most frequently, related instruction is
… a skilled tradesperson or craftworker. For the
…on or craftworker to be an effective trainer, he or
…not only know their trade skills, but also they
…eaching skills appropriate for conveying that
… to apprentices. This series of materials is
…train related subjects instructors in the critical
…kills necessary to perform their jobs effectively.
…f the booklets in the series are:

*…oduction to Related Subjects Instruction and
 …ervice Training Materials*
…ning the Apprenticeship Program
…ning Related Subjects Instruction
…eloping Instructional Materials for Apprentices
…enting Information to Apprentices
…ecting Learning Activities for Instruction
…iding for Individual Learner Needs
…trolling Instructional Settings
…luating Apprentice Performance
…mmunicating with Apprentices

… booklet introduces the series, describes the
… each booklet, and provides an overview of
…ship and of adult learners. The second booklet
…ow to plan an apprenticeship program and may
… related instructors, sponsors or service agen-
…of the other eight booklets deals with a set of
…lls judged by a panel of experts on apprentice-
…e critical to working effectively as a related
…structor.

What Is This Booklet About?

…terials in this booklet deal with planning the
…ship program. Planning is important because it

following skills required for the effective and efficie
planning and organization of an apprenticeship progra

1. Conduct occupational analyses to determine nee
   for, support for, and general content of the progra
2. Establish apprenticeship program goals and obje
   tives;
3. Incorporate ideas that facilitate upgrading of pr
   gram to keep current with new technology, ne
   training ideas and changes occurring in the o
   cupation.

This booklet is targeted at an audience of would-l
program sponsors, would-be service agency provide
such as instructors and administrators in communi
colleges or technical institutes, and individuals wh
currently provide services in apprenticeship programs.
does not deal with training skills as do the other bookle
in this series.

What Must I Do To Complete My Work In This Booklet?

Working your way through this booklet will require yo
to read the text, to answer the questions, to perform th
exercises, and to complete the pre- and post-assessme
instruments. Expect to spend about five hours workin
through the materials. The only resources you need
complete your work in this booklet are: (1) a copy of th
booklet; (2) a pencil or pen; (3) about two hours of tim
and (4) recollection of past related instruction experience

The materials are written in a self-instructional, progra
med format. You may work through the text, examples a
questions at your own pace and leisure; you need n
complete your work in the booklet at one sitting.

Each chapter in the booklet is devoted to a single sk
The general format of the chapters is similar, with t
following parts:

1. An *Introduction* describing the skill and the instru
   tional objectives for that skill.
2. *What* is, *when* and *why* to use the skill.
3. Step-by-step *directions* for how to perform the sk

- Complete the self-assessment;
- Read and consider in detail the introduction and objectives for each skill;
- Read and study the text, examples and illustrations provided for each skill;
- Complete the self-test exercise for chapter and compare your answers with those provided in the appendix;
- If you complete the exercise as directed, continue your work in the booklet; if you fail to answer the questions correctly, repeat your work in the chapter under consideration; and
- At the conclusion of the booklet, complete the posttest for the unit. Check your answers against those provided. If you exceed the criteria, continue

How Much Do I Know About The Subject Before I Begin

The self-assessment will assist you to identify competency areas associated with planning the program. Read each competency statement in Table 1 and assess your level of knowledge about it and degree of skill in performing that task. Knowledge is what you know about the subject while skill is your experience in successfully performing the task. Circle the number that best describes your level of knowledge and skill. Competencies where your ratings are low are those that you should concentrate on. Pay attention to the chapters which deal with those competencies.

Chapter in Booklet	Competency		Rating			
			Poor	Fair	Good	Ex
: Conduct pational analyses etermine need support for general content e program.	1. Assess needs for apprenticeship training.	Knowledge	1	2	3	
		Skill	1	2	3	
	2. Develop support for apprenticeship programs.	Knowledge	1	2	3	
		Skill	1	2	3	
	3. Establish apprenticeship committee.	Knowledge	1	2	3	
		Skill	1	2	3	
	4. Analyze apprenticeable occupations and identify work activities and tasks.	Knowledge	1	2	3	
		Skill	1	2	3	
	5. Determine job skills, knowledges and motivation necessary for performing work activities.	Knowledge	1	2	3	
		Skill	1	2	3	
Establish s and objectives pprenticeship ram	6. Set apprenticeship training standards.	Knowledge	1	2	3	
		Skill	1	2	3	
	7. Set apprenticeship administrative program standards.	Knowledge	1	2	3	
		Skill	1	2	3	
	8. Establish program goals/objectives.	Knowledge	1	2	3	
		Skill	1	2	3	
: Incorporate s that facilitate ading of program ep current new technology, training, ideas changes occurring cupations.	9. Update program periodically to include new technology, and/or training procedures.	Knowledge	1	2	3	
		Skill	1	2	3	

Determine Need For, Support For, And General Content Of The Program

Introduction And Objectives

The planning of an apprenticeship program must be based on a sound assessment of community need. A demonstrated need for skilled trade and craft persons is a powerful argument for an apprenticeship program and can be used to develop support by industry and labor leaders. Support for the idea of an apprenticeship program is absolutely essential since the success of the program is dependent upon a willingness of one or more sponsors to back the program.

Planning for an apprenticeship program requires a thorough understanding of the apprenticeable occupation. Based upon this understanding, job skills are identified and the knowledges and skills to be included in the apprenticeship program are determined. Thus, planning an apprenticeship program requires that a planner be able to:

1. Determine alternative means for assessing the local needs for apprenticeship training;
2. Identify possible ways of obtaining support for an apprenticeship program;
3. Suggest differing ways that an apprenticeship committee might be organized;
4. Identify the steps to be followed in conducting an occupational analysis;
5. Critique an occupational analysis to identify necessary job skills, knowledges and motivations;
6. Apply a technique to identify specific knowledges and motivations for a specified occupation.

As you begin to work through this unit of material, reflect back upon your apprenticeship experiences and knowledge. Draw upon these experiences as you consider how the ideas suggested in these materials could be incorporated into planning an apprenticeship program.

The What, Why, And When Of Apprenticeship Program Planning

Apprenticeship programs, like many other human activi-

is based upon a sound and thorough understanding of the need for action and the alternative available choices. This information is provided by a technique called *occupational analysis*. Occupational analysis is the systematic study of an occupation to determine: (1) the need for skilled persons to perform that occupation and (2) the skills, knowledges and attitudes required to achieve some mastery in that occupation.

Occupational analysis is a necessary first step in the planning of an apprenticeship program. However, before conducting an occupational analysis, one must first determine whether the occupation in question is an apprenticeable occupation. Apprenticeable occupations generally are defined as those occupations for which: (a) skills are learned primarily through a combination of on-the-job training supplemented by related technical instruction, (b) require at least 2,000 hours of work experience plus related instruction, (c) involve manual, mechanical or technical skills and are practiced industry-wide as a recognizable trade or craft, (d) involve the development of a body of skills sufficiently well defined to be applicable throughout an industry and (e) do not primarily involve selling, managerial, clerical or professional activities.

Identification of a shortage of skills in an apprenticeable occupation can be used to develop support for offering an apprenticeship program. Since apprenticeable occupations represent a major component of industrial productivity, employers are quick to recognize the threat posed by a shortage of skilled craft/trade personnel. Labor organizations are likewise responsive to labor shortages since shortages signal a possibility of decreased membership. Just as shortages signal an increased need for apprentices, surpluses indicate a diminished enthusiasm for new apprenticeship programs. The upshot is that the argument for offering a new apprenticeship program should be grounded in a documented need for the employment of additional apprentices.

Given that a need for apprentices has been established, the next decision is who will sponsor the apprenticeship program. Apprenticeship programs may be sponsored by a single employer, a group of employers, or a combined

2. Skill: Conduct Occupational Analyses To Determine Need For, Support For, And General Content Of The Program

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the extent to which craft employment in a community is dominated by a single employer;
- the willingness of employers to assume training responsibilities;
- the extent of collective bargaining agreements; and
- the local community history regarding apprenticeship training.

Administration of the apprenticeship program is the responsibility of a local apprenticeship committee or a designated official in a particular company. When a committee is used, generally it consists of members representing the sponsoring organizations. If a labor organization is jointly sponsoring an apprenticeship program, the committee is termed a joint apprenticeship committee. Responsibility of apprenticeship committees or the director of apprenticeship includes selecting and indenturing apprentices, supervising training, establishing training curriculum, and certifying apprentices as journeyman upon completion of the program. Given these responsibilities, the role of the apprenticeship committee or director in the planning of an apprenticeship program is well established. The extent to which the committee or director plans the program, implements the plan and monitors the results will determine the extent to which the apprenticeship program operates as an efficient and effective training system for the development of skilled craft personnel.

Although most directly involved in the administration of apprenticeship programs, local apprenticeship committees and apprenticeship directors are not the only entities involved in an apprenticeship program. Other groups and organizations include the U.S. Department of Labor's Bureau of Apprenticeship and Training (BAT), the Federal Committee on Apprenticeship (FCA), the State and Territorial Apprenticeship Agencies (SAC) and the National Joint Apprenticeship and Training Committees.*

Informed planning of an apprenticeship program requires detailed knowledge of the work processes, skills, knowledges, and motivation to perform as a skilled craft person. Provision of this information is the second major purpose of an occupational analysis.

Work activities, classified by major activity divisions of the trade, constitute the *work processes* that define the content of an apprenticeship training program. Work processes consist of major work categories and contain a series of activities under each category. *Activities* are general statements consisting of (1) an action verb and (2)

the object that is being acted upon. For example, a mobile mechanic is an apprenticeable occupation [that] may be divided into the following major work categories:

1. Lubrication;
2. Axles and Suspension;
3. Transmission and Clutch;
4. Brakes;
5. Motor Repair and Overhaul;
6. Carburetor;
7. Electrical System;
8. Cooling System;
9. Fuel System.

Activities under the major category of *Lubrication* include among other tasks: (a) fill or pack universal joints; (b) lubricate running gear; and (c) change oil and filters. The action verb — fill, pack, lubricate, change — indicates the work activity taking place. The object of the activity is universal joints with respect to fill or pack, running gear with respect to lubricate and oil and filters with respect to change.

Work processes provide a description of the major categories of work performed and a listing of component work activities for each major category. This way of describing the duties to be performed in an apprenticeable occupation provides a convenient organization for analyzing the job skills and knowledges required for successful performance in that occupation. *Job skills* are defined as statements of what the job holder must be able to do in terms of general areas such as: reading, writing, math, listening, observation and analysis, abstract reasoning, problem-solving, interpersonal relationships and psychomotor skills.

Knowledges are statements of what the worker must understand in order to perform successfully on the job. The distinction between job skills and knowledges emphasizes the difference between what an apprenticeship must be able to do in terms of job behavior (job skill) and the knowledges required to enable the apprentice to produce that behavior. In apprenticeship training, this distinction separates on-the-job training where the apprentice learns by doing and related instruction where the apprentice acquires the necessary knowledge to provide meaningful support to those activities performed on the job.

How To Conduct An Occupational Analysis

Step 1: Assess The Need For Apprenticeship Training In A Particular Trade Or Craft

Planning an apprenticeship program must be based on a clear demonstration of need. The most direct indicator of need is a shortage of skilled personnel in a particular craft or trade. The extent and severity of the shortage must be documented by hard data rather than speculation. A most direct way to collect such data is to survey employers about current and projected needs for craft or trade skills and the difficulties they are encountering or expect to encounter in hiring sufficient numbers of skilled personnel. Surveys may be conducted formally using a printed questionnaire or done more informally through telephone contact with a reasonable number of employers. Additional data on the demand for craft personnel in a local area can be obtained from the local office of the state employment security agency. Additional sources of information include associations of employers that logically would hire craft or trade members, appropriate union organizations, the State Apprenticeship Agency or the BAT state or district representative, and the National Joint Apprenticeship and Training Committee.

Data documenting existence of a shortage of craft/trade personnel is necessary but not sufficient to justify need for an apprenticeship program. To establish need, demonstrate either that no local training program exists that can fill the need or that there are strong reasons why an existing local program cannot be used. Thus, for a bonafide need to exist, you must first prove that a shortage of craft/trade personnel exists and that this shortage cannot be resolved by any existing apprenticeship program.

Step 2: Build Support For An Apprentice Program

A base of support must be established before an apprenticeship program can be offered. One way to marshal support is to examine organizations in the local community that are most affected by a skills shortage. These organizations will be responsive to suggestions for reducing the shortage. If skills shortages impact more heavily on a large craft employer in a community, then it would make sense to seek support from that source. If, on the other hand, shortages are being experienced by several employers, then their collective support should be sought. It may be that a labor organization sees in a shortage situation an opportunity to augment its membership roles. This being the case, and assuming that no programs are

used. Arguments for offering an apprenticeship program include:

- Apprenticeship develops and insures a supply of trained workers and supervisors for their operation;
- Apprenticeship increases worker productivity, overall skills level and versatility;
- Apprenticeship minimizes the need for supervision of employees by developing initiative;
- Apprenticeship continues to attract capable men and women into the trade.

There are some negative points to consider. These include:

- Apprenticeship increases training costs resulting from required journeymen's time for providing instruction and supervision.
- There is a cost resulting from somewhat lower initial productivity of apprentices; however, a portion of that cost is offset by the lower wages paid apprentices.
- There is no guarantee that the trained worker will stay with the company after completion of the apprenticeship period.

In order to convince an organization to sponsor an apprenticeship program, positive returns from adopting an apprenticeship program must be judged to outweigh its negative costs. It is your responsibility as an apprenticeship advocate to convince potential sponsors that the benefits exceed the costs. Remember, apprenticeship is an investment in human capital that pays continuing dividends to the sponsor.

Step 3: Constitute An Apprenticeship Committee

A sponsor or co-sponsors should appoint their representatives to the Apprenticeship Committee. Employer representation should include the Director of Personnel or the Director of Training, depending upon who has material responsibility for the training function. If the sponsor is a single employer, a craftsperson and a craft supervisor should be represented on the committee. If a collective bargaining agreement is in effect, the language of the agreement generally will indicate the appropriate union representation. If a group of employers have agreed to sponsor the program, then each employer should be represented on the Apprenticeship Committee. In the case where the number of employers is large, a

oup at periodic intervals. The chairperson should have sponsibility for the Committee agenda with the proision that any Committee member be allowed to place an m on the agenda for discussion.

ep 4: Determine Work Processes In A oosen Trade/Craft

The purpose of this step is to describe the actual work tivities that take place during the performance of the cupation. To insure that the description accurately ortrays what takes place on the job, an analysis must be nducted by a group of persons intimately familiar with t occupation. Because of the central role of the pprenticeship Committee in planning and administration the program, the committee should prepare the description. If members of the Committee feel that they do not ve a necessary familiarity with the occupation, they can point a stand-in representative. This situation might cur when the Personnel Director or Director of Training nnot be expected to have an operating knowledge of all prenticeable occupations. In these cases, a craft supersor should be appointed as a possible representative.

If the occupation has several specialities, these specialty eas should be represented. Perhaps additional crafts rsons can be utilized in the capacity of consultants to the pprenticeship Committee. In the case of group sponsorip, representatives should be selected that cover the nge of occupational activities found across all employers the group. This insures that persons familiar with all rformance variations of the occupation will participate production of the occupational description. For puroses of reference, this group is termed the *Analysis ommittee.*

Each member of the Analysis Committee should meet e following qualifications:

- Must have a demonstrated competence in the occupation;
- Must be employed or have been employed in the occupation;
- Must be able to work in a group;
- Must be able to verbalize the activities performed in the occupation;
- Must be committed to the importance of describing

job knowledges with work activities. Job knowledge assumed to be supportive of the performed activitie are *not* to be equated with these activities. As a pra illustration of the difference, knowledge about bi riding and actually being able to ride a bicycle are different. One might be quite knowledgeable a theories of bicycle balancing yet be unable to Conversely, one may be able to ride a bicycle yet hav knowledge of the underlying physical principles that it possible.

The Analysis Committee should meet in a we comfortable room that has a large uncluttered wall s The task of the Committee is to generate, thr spontaneous discussion, work activity statements describe what a skilled craftsperson must do. Each activity statement is preceded by the statement "A jou man must be able to . . . (work activity statement)." work activity statement consists of one or more a verbs and the object that is acted upon. For exam typical work activity statement for a mechanic migh "adjust front wheel bearings"; "rebuild and repai ferential centers"; or "re-face, re-seat and grind valve each case, the verbs describe what is done and the n indicate the objects acted upon. In most instances, eig ten words will suffice to capture the action verbs an objects of the action.

These statements should describe the actual performance of journeymen. Avoid statements tha dicate what should he known or understood since tho not observable directly. Prefacing each statement of activities with the phrase, "A journeyman must be able ." maintains this behavior-knowledge distinction cl and emphasizes the necessity to state work activiti observable terms.

As work activities are generated through Analysis (mittee discussion, write these activity statements on t by-five or four-by-six file cards. Letter the cards w felt-tipped pen. Print letters large enough to be se every Committee member in the room. As cards are out, attach them on the wall with plastic putty or s other adhesive. Preferably walls should be on the dimension of the room and must be well lighted and of any obstacles.

Divide the apprenticeable occupation into major

Major categories of work for carpentry might include, for example:

1. flat work;
2. roughing and framing;
3. scaffold buildings;
4. building and setting concrete forms;
5. installation, erection and repair of fencing metals and woods;
6. layout;
7. roof framing, cornices and bay framing;
8. trim;
9. exterior covering; and
10. woodworking machines.

As a rule of thumb, the number of major occupational categories identified should not exceed ten to twelve.

Once a major category has been identified, write it on a card and affix it to the left end of the empty wall. Use the major occupational category to focus committee discussion and identify work activities falling under that major category. The task of the Committee is to brainstorm amongst themselves until they have come up with a satisfactory definition of the work activities making up that category. Write each activity on a card as it is defined. Post it to the right of the major category card in a horizontal line. Thus when complete, there will be a single *row of cards* that when considered together describe a major work category and its associated work activities. In most cases, ten to fifteen work activities are sufficient to exhaust the variety of activities performed. If more work activities are suggested, review them carefully so as to combine them with existing statements. If the Committee feels that significantly more work activities are required, this probably means that a major category was too broadly defined. Split this major category into smaller categories. In an opposite case, if the Committee is unable to come up with a significant number of work activities for a given major category. Combine the category with an existing category.

Repeat the process until all major categories and their associated work activities are defined to the satisfaction of the Committee. The product will be multiple rows of cards running horizontally across the wall. Each row will reflect a major category of the apprenticeable occupation.

The last task then remaining is to sequence the work activities within each major occupational divisional category. Sequencing should reflect the order in which the work activities must be learned. The Analysis Committee

committee members should then ask thems[...]
activity should be learned first and i[...]
remaining activities should be learned. [...]
the horizontal row from left to right to [...]
levels of complexity. In a similar mann[...]
tasks of every other remaining row in [...]
priority.

Each row should then be compared [...]
row of cards. Do this by selecting a [...]
compare with the baseline. Compare th[...]
row, that is, the one at the farthest right [...]
room, with the right most card of the b[...]
work activity on the last card of the comp[...]
learned at the same time as the activity [...]
the baseline row, then place the two ca[...]
each other. If the last card on the base[...]
learned before the last work activity o[...]
row, place the card on the comparison [...]
Likewise, if the work activity on the [...]
comparison row must be learned befor[...]
on the last card of the baseline row, ther[...]
the comparison row, to the left of the [...]
baseline row. Determine the exact plac[...]
by comparing it with the next-to-the [...]
baseline row. If these two tasks can [...]
taneously, then place the cards directly a[...]
not, compare the first card with some oth[...]
the left on the baseline row until you [...]
baseline row that contains an activity tha[...]
the same time. This will then establish [...]
the comparison card.

Continue this activity until all cards [...]
placed in proper order with the compar[...]
The result is not only a sequence for the [...]
activities within each row, but also a seq[...]
across major work categories. This stru[...]
you in determining the order in whi[...]
should be learned.

The process of identifying work activ[...]
mining their proper order and structure [...]
by a coordinator. The role of the coordi[...]
Analysis Committee and to make sure t[...]
is mindful of its purpose and func[...]
encourages Committee members to fo[...]
and efforts on the attainment of these p[...]
the coordinator's responsibility to p[...]
orientation to the Committee and to s[...]

misunderstanding of the process and too narrow a focus on the scope of work activities to be defined. The coordinator must be able to explain the mechanics of the process and to illustrate by example the level of detail required by the process.

Identification of the work activities is made easier by tangible materials, objects, products or pr[...] with on the job. *People* refers to various rel[...] others that are required in the conduct [...] occupation in question. As an aid in selecti[...] a number of these verbs are classified in Fig[...] to whether they refer to data, things or peo[...]

Numerical/Written Material

abstracts	describes	looks up	refers to	tabulates
analyzes	detects	monitors	registers	transcribes
calculates	discovers	observes	reproduces	transfers
checks	edits	obtains	retrieves	transforms
classifies	estimates	prepares	reviews	translates
collects	evaluates	presents	routes	types
compiles	files	processes	scans	verifies
computes	gathers	produces	seeks	writes
considers	integrates	reads	solves	
copies	interprets	receives	stores	
counts	listens	records	summarizes	

Things

Materials/Objects/Events/Products/Procedures

abrades	creates	guards	organizes	sells
aligns	cuts	handles	packs	shapes
alters	decorates	hangs	paints	shaves
answers	delivers	holds	pastes	smooths
applies	demolishes	identifies	participates in	specifies
appraises	demonstrates	implements	places	splits
arranges	designs	initiates	planes	sorts
assembles	detects	inspects	plans	stores
assesses	develops	installs	plasters	tests
bakes	disperses	issues	pours	trims
balances	disconnects	judges	prepares	turns
bids	dispatches	keeps	presses	types
bores	draws	lays out	processes	unloads
builds	dresses	loads	produces	uses
burns	drills	locates	programs	washes
buys	engraves	maintains	protects	watches
calibrates	erects	makes	receives	weighs
carves	establishes	marks	recognizes	welds
casts	etches	measures	reconditions	
checks	evaluates	mills	refinishes	
chips	examines	miters	removes	
classifies	executes	mixes	repairs	
cleans	expedites	models	replaces	
codes	facilitates	mounts	reproduces	
compares	fastens	navigates	requisitions	
conducts	files	nets	routes	
connects	forms	notes	samples	
constructs	formulates	numbers	saws	
cooks	gives	observes	schedules	

Machines
Major pieces of machinery or equipment

sets up
operates
drives/controls
tends
maintains
repairs

People

Clients/Customers/Co-workers/Supervisors/Employees/Patients

advises
amuses
appraises
assesses
assigns
assists
cares for
communicates with
confers with
consults with
controls
coordinates
councils
directs
disciplines
discharges
discusses with
encourages
explains
grooms
guards
guides
hires
influences

instructs
interviews
involves
leads
manages
organizes
orients
persuades
prepares
protects
receives
refers
selects
serves
shows
speaks to
stimulates
supervises
talks to
teaches
tests
trains
waits on

...cesses of the apprenticeable occupation. Work pro-
...sses descriptions can be taken directly from the arrange-
...ent of cards produced in the preceding step. Before the
...rds are removed from the wall, give each row of cards an
...entification number. Assign each card within the row a
...ter of the alphabet starting with "a" on the left most card,
..." to second card on the left and so forth until all cards in
...e row have been assigned an alphabetic letter. Also
...sign each card the number of the row to which it is
...signed. Thus, each card will have a number and a letter
...dicator on it. This enables you to restructure the cards, if
...u so desire.

...Given the way the cards have been structured in the
...evious step, all work activities on cards with the same
...phabetic letter can be learned at the same time. The
...rning order of all tasks can be established by ranking
...ks according to their alphabetic designation. Those
...ving earlier letters in the alphabet must be learned prior
...those with later letters in the alphabet.

...By coding each work activity with a number designating
...e major activity to which it belongs and a letter indicating
...e learning order, the work processes description of the
...prenticeable occupation can be established according
...the following format:

1. Title of the major work activity represented by row
   one;
   a. Work activity on the card bearing the code 1a;
   b. Work activity on the card bearing the code 1b
      .
      .
      .
2. Title of the major work activity represented by row
   two;
   a. Title of the work activity on the card coded 2a;
   b. Title of the work activity on the card coded 2b
      .
      .
      .
3. Title of the major work activity represented by the
   last row where N equals the total number of work
   activities considered.

The preceding format will provide an ordered
...cription of the major divisions of the apprentice...
occupations and the work activities comprising...
occupational division. Because of the nature of the pro...
used to generate the work activities, each work ac...
represents a statement of observable behavior on the...
Analysis Committee members were instructed specif...
to separate job behaviors from knowledges and u...
standings necessary to produce these behaviors. ...
therefore the purpose of this step to concentrat...
identifying skills and knowledges that support the ...
activities. As in previous steps, identification of skill...
knowledges can best be undertaken through applic...
of a systematic procedure.

Recall that the Analysis Committee members ...
instructed to consider the occupation in terms of its ...
things, and *people* requirements. Use the same ...
categories as a basis for analyzing the occupatio...
determine what skills and knowledges an apprentice...
have in order to perform the identified work activ...
Prepare a separate skills-knowledge analysis sheet for...
of the three areas. Divide the *things* dimension ...
subdivisions of (a) tools used, (b) materials, parts or fix...
used, and (c) machinery or equipment used.

Analysis sheets are shown in Figures 3-7. Note...
all of the skills-knowledge analysis sheets follow...
same basic format. Each begins by listing the ...
types and kinds of data, things or people dealt with...
careful to provide an appropriate level of det...
serves no major purpose to list every single tool ...
materials used on the job because this results in ...
necessary detail. On the other hand, too bro...
classification runs the risk of missing major typ...
tools, materials and equipment that may have ...
cialized knowledge requirements. The intent ...
define as major categories only those areas of data,...
ple and things that have materially different know...
requirements. As in the classification of general ...
areas, the ultimate level of specification of detail i...
to the discretion of the final users.

including tools such as technical manuals; instruction sheets; purchase orders; shipping invoices; work orders; and read-outs from dials, gauges or other test/measurement instruments.

____ Basic terms, symbols, and defi[...]
used in the occupation
____ Procedures and practices requi[...]
orders/requisition/forms/routi[...]
such documents
____ How to maintain work records [...]
prescribed format
____ How to prepare work performa[...]
____ How to write letters/memos/r[...]
____ How to compare whole numb[...]
bers, fractions, mixed numbers[...]
____ How to convert decimals to fra[...]
mixed numbers, proportions t[...]
____ How to add, subtract, multiply [...]
numbers, decimal numbers, fra[...]
numbers, denominational num[...]
and/or percentages
____ How to measure distances, ang[...]
perimeters, circumferences, arc[...]
of change
____ How to solve algebraic equat[...]
more unknowns

B. Apprentice Must Be Able To: (Check all that apply)

____ Recall factual information
____ Interpret tables, charts or figures
____ Locate required data in technical reference sources
____ Interpret and follow a variety of technical instructions represented in mathematical or graphical form
____ Keep records according to a prescribed standard of recordkeeping
____ Record and/or compile observed data in written or tabular form
____ Examine and determine values of data after using specialized measurement techniques
____ Compute basic measurements (e.g., dimensions, tolerances, spacing, location, angles, diameter, area, rates)
____ Solve algebraic equations
____ Input and retrieve data from computer-controlled systems

D. Based on the worker knowledges [...]
please provide a description of th[...]
edges required for each area check[...]

C. Apprentice Must Know (Check all that apply)

____ How to read and follow technical instructions
____ How to use tables, charts and figures
____ How to read blueprints, schematic drawings or orthographics
____ How to read information from dials, gauges, meters or other such devices
____ Procedures for locating and using technical reference documents

A. List all major types of tools used:

B. **Apprentice Must Be Able To:** (Check all that apply)

_____ Select appropriate tool(s) for task at hand
_____ Make necessary set up or adjustments required to prepare and use the tool(s)
_____ Use tool(s) in a safe and proper manner
_____ Provide for routine care and maintenance of tools

C. **Apprentice Must Know:** (Check all that apply)

_____ Name of tool(s)
_____ Distinguishing characteristics of tools
_____ Purposes or functions served by tool(s)
_____ Procedures for using tool(s)
_____ Causes of tool-related accidents
_____ Safety procedures
_____ Maintenance procedures
_____ Scientific/physical principles underlying tool operation

List all major types of materials/parts/fixtures used on the job:

Apprentice Must Be Able To: (Check all that apply)

___ Select materials/parts/fixtures that are appropriate for the task at hand
___ Prepare materials/parts/fixtures
___ Store materials/parts/fixtures in a safe and proper manner
___ Apply/install or otherwise use materials/parts/fixtures in accordance with commonly-accepted trade or craft standards
___ Diagnose malfunctions to determine what parts need replacement or reconditioning
___ Disassemble assemblies into component parts
___ Assemble parts into subunits and/or assemblies

C. **Apprentice Must Know:** (Check all that apply)

___ Common names for materials/parts/fixtures commonly used
___ Distinguishing features/characteristics of different kinds of materials/parts/fixtures
___ Function(s) of parts/fixtures/materials
___ Methods and procedures for preparing materials
___ Methods and procedures for storing materials
___ Installation/application procedures
___ Problems commonly encountered in the use of materials
___ Testing procedures to determine whether parts/fixtures are effective or need replacement
___ Order of assembly operations

D. Based upon the worker knowledges checked above, please provide a statement of the specific knowledges required for each area checked.

_____ Operating procedures

_____ Maintenance procedures/schedules

_____ Principal causes of machinery/equipm
function

_____ Basic functions or purposes performe
chinery/equipment

_____ Basic scientific and/or physical theori
lying machinery/equipment operation

_____ Diagnostic methods and techniques usi
inery/equipment

_____ Standards for judging quality of work p

_____ Methods for repairing machinery/equi

_____ General maintenance procedures

D. Based upon the general knowledge areas
please provide descriptions of specific kn
for each area.

B. Apprentice Must Be Able To: (Check all that apply)

_____ Perform initial set up of machinery/equipment
to perform their function

_____ Operate equipment/machinery or otherwise per-
form processes requiring continuous monitor-
ing, controlling, regulating or maneuvering (e.g.,
driving motorized vehicles, operating cranes,
hoists, saws, cutters)

_____ Operate machinery/equipment to rigorous stand-
ards of accuracy and precision

_____ Feed materials and/or off-load product

_____ Carry out detailed testing and/or diagnostic
procedures requiring machine/equipment opera-
tion

_____ Maintain machinery/equipment

_____ Repair, overhaul, or otherwise recondition ma-
chinery/equipment

_____ Repair, overhaul or otherwise recondition mach-
inery/equipment

with:

_____ How to listen and carry out instructions
_____ How to communicate intention and feelings to others
_____ Ways and means of motivating people
_____ How to influence others
_____ Principles and practices of good supervision
_____ How to train others
_____ How to be sensitive to the needs of others
_____ How to evaluate performance of others
_____ How to deal with people

D. Based upon the knowledge areas checked above, please provide descriptions of specific knowledge required for each of the checked areas.

Apprentice Must Be Able To: (Check all that apply)

_____ Follow verbal instructions from others
_____ Communicate results and findings to customers, co-workers, supervisors or others
_____ Counsel and advise others
_____ Recognize and attend to the needs of others
_____ Influence others in favor of a product, service or opinion
_____ Supervise others
_____ Negotiate, arbitrate or otherwise engage in delicate social bargaining
_____ Train others by explanation, demonstration or supervised practice

After the listing of specific categories of data, people and/or things, the analysis sheets contain space to list a number of activities that apprentices perform on the job. If these activities are required in the performance of the job described in the work process description, then check each statement that applies. This operation focuses attention on specific types of work activities that are closely related to and supported by worker knowledges and understandings.

Given that these knowledge-dependent activities have been identified, the analysis sheet requires that the general knowledge areas be identified. These general knowledge areas have a close correspondence with activities previously identified. For example, with respect to machinery and equipment, if an apprentice must maintain machinery and equipment in operating order, then it follows that the apprentice must know the proper maintenance procedures. The analysis sheet is intentionally structured to lead analysts from the specific aspects of data, people or things through generalized work activities to a focus upon the general knowledge areas required to support that activity. The final requirement of the analysis sheet is a specification of the required specific knowledges. Accomplish this by reviewing the general knowledge areas checked and specifying in more concrete terms the nature of the knowledge to be acquired. For example, if it has been determined that an apprentice must know proper maintenance procedures, then the necessary specificity can be provided by stating the major types of machines or equipment for which the maintenance procedures must be known.

The intent of the skills-knowledge analysis sheet is to provide a logical procedure for deriving the knowledges necessary to support job performance as described by the work activities. This procedure will provide an objective basis for the identification of required knowledge and will assure that knowledges identified will be those which are demonstrably related to job performance.

Identification of skills and knowledges is based upon the work processes descriptions. The skills-knowledge analysis should be performed sequentially. Once selected, a skills-knowledge analysis sheet should be completed in its entirety before going on to another. Work process descriptions should be used in the following manner. Study in detail the first work process and its associated work activities. Complete a skill-knowledge inventory sheet for that work process. Upon completion of the skills sheet for the first work process, repeat the

Continue procedure until all major processes and their associated tasks are analyzed. By doing the analysis in a sequential manner, you avoid duplication because of those skills and knowledges not previously recorded or entered.

Conduct of the skills-knowledge analysis should be the responsibility of the Analysis Committee as constituted in Step 4. This Committee has been selected because of their knowledge of the occupation in question. It follows that they should be the most knowledgeable regarding the skills and knowledge requirements of that occupation. Because of the somewhat different mind-set involved, it is recommended that identification of work activities and the analysis of the work processes to determine knowledges and skills be conducted in separate settings.

Whereas the previous analysis procedures dealt with identification of required knowledge, an occupational analysis is incomplete without an investigation of the motivational and psychomotor requirements of the occupation. Procedures for performing these analyses are indicated in Figures 8 and 9.

As indicated in Figure 8, the motivational analysis sheet concentrates on the levels of apprentice motivation in terms of: (a) what they should be willing to do, (b) what they should find satisfaction in doing and (c) what they should be committed to doing. The analysis of those aspects considered important for an apprentice to be willing to do should concentrate on those aspects of the occupation that are not the most desirable nor pleasant parts, but are necessary to be performed by anyone working in the occupation. Satisfaction deals with those parts of a job that apprentices should find rewarding to perform. Commitment is an even higher level of motivation and refers to those central values that should represent the driving motivational force. Together, these three levels of motivation allow a statement of motivational requirements to be constructed that will provide apprentices and applicants with information as to the motivational requirements of the apprenticeable occupation.

In a similar manner, the psychomotor requirements of the occupation can be determined. The intent of this analysis is to identify physical activity requirements that significantly differ from normal expectations, either in terms of frequency, intensity, or or special requirements. For example, if balancing is required for walking on narrow catwalks, then this would be considered a deviation from a normal balancing requirement of most occupations and should be indicated. The

people but are necessary to perform the job. Include items like working conditions, hours, travel, and s

Apprentice Should Find Satisfaction in: (List major kinds of work situations that apprentices should find r
items like performing changing duties, performing routine tasks, dealing with people, working under
difficult problems, and so forth.)

Apprentice Should Be Committed To: (List major areas that should be the central concerns for all app
items like safety, quality, customer satisfaction, craftsmanship, and so forth.)

Coordination To: (Check any of the following activities which require unusual or strenuous physical requirements.)

physical activities for each activity checked a

____ Walk	____ Carry
____ Crawl	____ Push
____ Run	____ Pull
____ Climb	____ Grasp
____ Balance	____ Position
____ Stoop	____ Turn-twist
____ Kneel	____ Swing
____ Crouch	____ Assemble
____ Stand	____ Disassemble
____ Sit	____ Write
____ Reach	____ Draw
____ Step	____ Draft
____ Lift	____ Talk

ge requirements are being identified. Once completed,
e Analysis Committee will have performed a valuable
rvice in that they will have identified the work activities
be performed and the knowledges, motivations, and
ychomotor abilities required to perform those activities.
ese requirements are at the core of planning for an
prenticeship program. They serve as the basis for
veloping the related knowledges and understandings
those apprentices who possess the necessary motiva-
nal and psychomotor capabilities to perform on the job.

Example

The ABC Construction Company is a medium-sized firm
ecializing in highway construction. During the past five
ars, the company has been experiencing a shortage of
alified heavy equipment mechanics. General foreman,
ntos Garcia has become particularly concerned about
s problem and is convinced that the shortages will
come critical unless something is done quickly. His
ncern builds to the point that he discusses the situation
h the company personnel manager, Bill Anderson.
rcia finds that Anderson shares this concern. They
cide to find out whether other construction firms in the
a are having similar problems. Anderson telephones
veral of his counterparts in other construction firms and
rifies that they, too, are experiencing similar hiring
fficulties. During the course of the conversations, some-
e suggests that perhaps some action be taken jointly.
derson is sympathetic to the suggestion and devotes
ie to exploring the sources of labor supply for heavy
uipment mechanics. He calls the secondary school
tem and is told that no vocational program exists in that
a. He also contacts the local technical institute where he
old that they are aware of a demand in that area, but that
uipment costs are so great that they are reluctant to
tiate a program.

warrant assuming the training burden. He discusses
idea with Garcia, who agrees that on-the-job tra
would be an ideal way to train heavy equipment m
anics, but also has reservations about the limited num
and the cost involved.

In the course of their conversation, they come to
conclusion that such training would be feasible i
training could be jointly provided by several emplo
Anderson agrees to explore this possibility. He con
personnel and training directors of other construc
firms in the local area. Representatives in five firms exp
interest in jointly sponsoring a training program for h
equipment mechanics. The five meet as a group to dis
the outline of a training program. They decide tha
apprenticeship model seems to be the best option.
natural outgrowth, this group is formally constituted a
apprenticeship committee and is charged with the
ponsibility of developing an apprenticeship progran
heavy equipment mechanics.

Their first order of business is planning the appren
ship program. Since five firms are involved, the comm
members feel it necessary to establish a formal descrip
of the work activities performed by heavy equip
mechanics. Because none of the personnel or trai
directors feel they have sufficient knowledge of the
they delegate this responsibility to their general forem

The general foremen meet as a group to identify
activities. They use the procedures described in Step
develop their processes description. The work pro
description developed by this group is in Figure 10.

Based upon the above work processes, the Ana
Committee determines the knowledges, motivations
psychomotor skills necessary to perform these activ
For purposes of this example, only the skills-knowle
analysis pertaining to the use of tools will be prese
The analysis sheet filled out by the Committee is prese
in Figure 11.

1. Mount and adjust construction machinery equipment.

   a. Position construction equipment in proper mounting alignment.
   b. Mount construction equipment using proper mechanical fasteners.
   c. Connect mechanical, electrical and hydraulic linkages and controls.
   d. Inspect controls to verify that they are operating properly.
   e. Field or shop test mounting to insure proper operating condition

2. Service and repair running gear.

   a. Inspect track chains, track rollers, front idlers, top idlers, pads and wheels.
   b. Remove, repair and install track chains.
   c. Remove, repair and install track rollers.
   d. Remove, repair and install front and top idlers.
   e. Remove, repair and install pads and wheels.
   f. Inspect and install wheel drums.
   g. Remove, inspect, replace and lubricate wheel bearings.
   h. Inspect, adjust and replace brake shoes.
   i. Inspect, disconnect, clean, overhaul and replace brake cylinders.
   j. Inspect and replace brake lines.
   k. Inspect, test and replace steering linkage components.

3. Service and repair power train assemblies.

   a. Drain and replace power or lubricating fluid supply.
   b. Disconnect, adjust and reconnect control linkages.
   c. Remove, service and replace universal joints.
   d. Remove, inspect, repair and install clutches.
   e. Disassemble, inspect, replace parts, adjust and reassemble transmission and torque converters.
   f. Remove, inspect, adjust, replace parts and install differentials and final drives.
   g. Detect running faults in transmission, torque converters, differentials and final drives.

4. Service, repair and overhaul gas and diesel engines.

   a. Drain, change filters, replace and replenish chassis lubricants.
   b. Remove, inspect, replace ... [text cut off]

... pumps and filter.
   d. Remove, clean, inspect an[d] ... heads.
   e. Remove, clean, replace par[ts] ... valve lifters.
   f. Inspect, remove and repl[ace] ... sprockets and gears.
   g. Remove, clean, inspect and i[nstall] ...
   h. Remove, inspect, analyze we[ar] ... and install bearings.
   i. Grind valves and ream valve ...
   j. Remove, clean, inspect and re[place] ... distributor drive.
   k. Clean, inspect and ream cy[linders,] ... remove pistons.
   l. Remove connecting rods ca[ps] ... and reassemble.
   m. Inspect and deglaze cylinder ...
   n. Assemble pistons.
   o. Inspect connecting rods, rea[ssemble] ... pistons.
   p. Detect and diagnose engine ...

5. Service and repair fuel system.

   a. Remove, clean and inspect air ...
   b. Remove, clean, replace and i[nstall] ... filters.
   c. Remove, test and replace fue[l] ...
   d. Inspect, remove, repair and ... and filler pipes.
   e. Remove, replace and tune c[arburetors/] injectors.
   f. Dismantle, inspect, replace pa[rts] ... carburetors and/or fuel inje[ctors.]
   g. Check and balance fuel eject[ors.]

6. Service and repair electrical syste[m.]

   a. Inspect, test and service batt[ery.]
   b. Inspect, test and replace bull[ ] ... gates.
   c. Test circuitry.
   d. Check, inspect, repair, and r[eplace] ... connections.
   e. Inspect, repair and replace w[iring connec]tions.
   f. Remove, clean and install ge[nerators/] motors.

A. List all major types of tools used:

1. Hacksaws, chisels, handcutters and other cutting tools
2. Pliers, clamps, vices and other holding tools
3. Wrenches, screwdrivers and other threaded fastening tools
4. Hammers, punches, drifts and other driving tools
5. Twist drills, reamers, borers, tools and coolants
6. Portable and bench power tools
7. Torquing devices
8. Taps, dyes and other threading devices

B. **Apprentice Must Be Able To:** (Check all that apply)

__X__ Select appropriate tool(s) for task at hand
_____ Make necessary set up or adjustments required to prepare and use the tool(s)
__X__ Use tool(s) in a safe and proper manner
__X__ Provide for routine care and maintenance

C. **Apprentice Must Know:** (Check all that apply)

__X__ Name of tool(s)
__X__ Distinguishing characteristics of tools
__X__ Purposes or functions served by tool(s)
__X__ Procedures for using tool(s)
__X__ Causes of tool-related accidents
__X__ Safety procedures
__X__ Maintenance procedures
_____ Scientific/physical principles underlying tool operation

D. Based on the worker knowledges checked above, please provide a description of the specific know
   each area checked.

1. Learn names of all major classes of tools used, e.g., cutting tools, holding tools, fastening tools,
   reamers and boring tools, portable and bench bar tools, torquing devices, and taps, dyes a
   devices.
2. Must know the characteristics that distinguish major types of hand and power tools used.
3. Must know the major purposes and uses of each class of tools.
4. Must know how to operate each class of tools in a safe and proper manner.
5. Must know the major hazards associated with the use of each major type of hand and power
6. Must know the safety procedures to be used in order to avoid major tool hazards.
7. Must know how to maintain a class of tools in proper operating order, including cleaning, l
   procedures.

R.E. Adams. *DACUM: Approach to Curriculum, Learning and Evaluation in Occupational Training*. Ottawa, Canada: Department of Regional Economic Expansion, Canada Newstart Program, 1975.

Self-Test Exercises

Answer the following questions in the space provided or on separate work paper. Compare your answers with those provided in the Appendix of this booklet.

1. List at least three ways to assess the need for apprenticeship training. For each method, identify a positive and a negative argument for its use.

   Method

   a.

   b.

   c.

   For

   a.

   b.

   c.

   Against

   a.

   b.

   c.

2. You have been called upon for ideas as to how support for an apprenticeship program may be developed. Outline a series of steps that could be taken.

4. Outline the procedure for cons process description.

5. Which of the following statements work activities descriptions?

   a. Inspects castings for visual defe

   b. Familiar with reporting proced

   c. Troubleshoots control panels

   d. Erects external siding accordin

   e. Understands application of Oh design

6. Consider a specific apprenticeable which you are familiar. Outline determining the *people related* s edges.

Introduction And Objectives

Once the required knowledges, motivation and psycho-
motor abilities have been identified, a program must be
designed for their attainment. The program design consists
of two separate components: (a) the basic standards that
describe the characteristics and procedures of the program
and (b) the statement of goals and objectives that indicate
what the program intends to accomplish and the means for
accomplishment. For the sake of clarification, standards
have been divided into those that pertain specifically to the
training activities and those that pertain to the administra-
tion of the training program. Standards that refer to
conditions of training are referred to as *training standards*.
Those that pertain to administration are termed *adminis-
trative standards*. *Goals* refer to those broad statements
that describe the overall purpose of the training program.
The means chosen for the achievement of these goals are
termed *objectives*. Upon completion of this unit of mate-
rials, you should be able to demonstrate your competency
by being able to:

1. Define the purposes served by apprenticeship pro-
   gram basic standards;
2. Identify the topics to be covered by basic program
   standards;
3. Construct and critique specific program standards;
4. Specify the distinction between program goals and
   objectives; and
5. Write and critique specific program goals and related
   objectives.

Why Do We Need Standards And How Do They Relate To Goals And Objectives?

If you think of planning as creating an organizational
design to manage training, then standards serve as the
blueprints of the training system. They show how the
training will be organized and operated. Just as blueprints,

managed and the rules and procedures governing
operation.

Whereas standards are statements of what the program
is, goals and objectives are statements of intended
results and procedures for the program. Program goals
statements of results expected to be achieved at s
future date. They are broad targets that the program s
to achieve. When taken together, they describe the b
mission or purpose of the program.

In contrast to goals, objectives are more immec
statements of short-term results necessary for goal at
ment. Objectives should:

- be worthwhile and significant;
- make a real contribution to program goals;
- be set neither so high as to make them unattain
  or so low that their achievement is meaningles
- suggest appropriate strategy procedures and tec
  ques for the attainment of related goals;
- indicate numbers to be served, skills to be
  veloped and/or other measurable quantities tha
  be used to evaluate attainment of program goa
- be precisely stated to reduce the possibilit
  misunderstanding their intent;
- be shared with those who have a stake in
  apprenticeship program outcomes.

How To Set Standards

Work Processes

The most central training standard is that provid
the work processes description (refer to Chapter 2-Ste
As you will recall, the work processes description state
general divisions of the apprenticeable occupation ar
associated work activities that fall under each
division. These work activities are sequenced in the
in which they are to be learned. Taken as standards,
work activities provide the specification for the conte
be learned in the course of the apprenticeship. They
as ready communicators of the content areas t

Related instruction refers to the learning that takes place, ually in a classroom situatinn, that is designed to provide e knowledges and understandings needed to support d supplement actual job performance. The cnntent nsists of those concepts that flow frnm the application of ore basic theories and practices to on-the-job expe- nce. Mnre basic theories and practices provide models t apprentices can use to derive meaning frnm their periences and tn explain why things happen as they do the job.

Because these theories and models are more generaliz- le and are mnre difficult tn infer from job experiences, it frequently more efficient to deal with them in a ssroom setting where the apprentice is free to engage in e more abstract considerations necessary for their under- nding. A fundamental point of importance, however, is t these mnre basic and abstract theories, principles and dels are of importance only to the extent they assist the prentice to interpret his/her job experience and to rform his/her craft/trade more effectively.

The task is to decide which knnwledges can be learned st on the job and which knowledges can be learned best a related instruction context. This task can be ap- oached by reviewing the knowledges identified in the lls-knowledge analysis sheets as described in Step Five the previous Chapter. Each skills analysis sheet contains sting of those knowledges identified as contributing to e performance of job skills. Each knowledge statement ould be assessed to determine whether it can be learned st on the job, in a related instruction setting or in both tings. Make the decision by using the following criteria:

On-The-Job Training

- Can be used to impart knowledge In situations where apprentice can learn from direct observation and where there are standard operations, techniques and/nr practices that can be nbserved and modelled by the learner;

- is particularly well-suited to situtalons where the apprentice can infer desired knowledge from actual hands-on experience and can profit from trial and errnr, and where there are definite perfomance standards that can provide immediate knowledge of results that reward the learner for correct behavior.

- Most useful when mistakes are not overly costly in terms of spoiled material, damaged equipment,

resultants of the theory can be observed;

- Situations where trial and error learning may inappropriate; e.g., operational procedures w safety factors may prevent trial and error learn situations that occur relatively infrequently bu critical when they do occur, and situations w verbal descriptions may provide an acceptable stitute for actual experience.

- Can provide a simulation of on-the-job behavio as to reduce risk and cost.

Each knowledge statement should be evaluated acc ing to the above criteria and a decision made as to who it is more approprhtely learned on the job, in a rela instruction situation or a combination of the two. Re this procedure until all the knowledge statements id fied In Step 5 of the preceding chapter have b appropriately classified. The result will be an obje determination of the knowledges to be learned in rel instruction.

These knowledges when collected together and sented as a list constitute the content standard for rel instruction.

Safety And Health Training

Review the knowledge statements on the skills-kn edge analysis sheet to determine which statements a to safety procedures. Identify, group and report separ the safety knowledges. They are the safety and h training standards for the apprenticeship program desired, these statements may be supplemented statement that provides assurances that these knowle will be developed in a healthful work place that m applicable federal and state requirements.

Term Of Apprenticeship

Review the work processes of the apprenticeable occ tion and determine the number of instructional h required to develop journeyman competencies In t work actvities. The decision should assume a journey with average mentality and capabilities and with creditable prior work experience to draw upon. The number of hours for similar apprenticeship program

Once a total number of hours has been determined, [ap]portion the total number of hours across the major [oc]cupational divisions contained in the work processes [d]escription. Given that a specified number of instructional [ho]urs has been assigned to each major occupational [di]vision, allocate the hours to each work activity within that [di]vision. Thus, the finished product will be an allocation of [th]e total number of instructional hours to each work [ac]tivity comprising the work processes description. Instruc[ti]onal hours so allocated become the standard and serve as [th]e basis for management of the apprenticeship training.

Instructional hours also should be allocated to related [in]struction. Review each knowledge statement and esti[m]ate the number of instructional hours required to [de]velop competency in that knowledge area. Total the [in]structional hours assigned to related instruction and [re]view the total in comparison with the total number of [in]structional hours. If the number of instructional hours [as]signed to related instruction appears disproportionately [la]rge or small, the allocation procedure can be modified [ac]cordingly.

The result of this process is an assignment of instruc[ti]onal hours to related instruction based upon the knowl[ed]ges to be learned in training other than on-the-job [tra]ining. This provides a specific and defensible argument [fo]r the assignment of specific numbers of instructional [ho]urs to related instruction. These hours, once specified, [co]nstitute the standard with respect to the number of [pro]gram hours devoted to related instruction.

Probationary Period

A probationary period should be established during [wh]ich the apprentice must demonstrate his/her capability [to] learn the skills necessary to function as a craft/[tra]desperson. As a general rule, a period of one year is a [co]mmonly-accepted probationary period. Whatever the [pe]riod, the means of appraising apprenticeship perfor[ma]nce to determine whether the apprentice has passed [th]e probationary period should be made explicit. Per[for]mance appraisal is generally a function of supervisory [ev]aluation and is described in the next section.

by the immediate supervisor in terms of job performa[nce] and by the related instructor. For the case of the appren[tice] supervisor, it is recommended that performance be r[ated] on a simple five-point scale with scale values b[eing] interpreted as follows:

- 0. Apprentice unable to perform work accordin[g to] acceptable standards;

- 1. Apprentice requires direct supervision and consi[der]able assistance in defining the task to be perform[ed,] selection of tools, handling of materials, sequen[ce] of job activities, and so forth;

- 2. Apprentice can work unassisted on job under f[ew] routine standardized conditions but requires ass[ist]ance in getting started and in dealing with una[nti]cipated problems, events and circumstances;

- 3. Apprentice able to work without assistance in v[arious] *activities under standardized conditions, may [re]quire occasional assistance in dealing with spe[cial] problems and/or in diagnoses of malfunction[s and] dealing with other unusual circumstances;

- 4. Apprentice able to perform as journeyman, work[ing] without direct supervision and successfully [per]forming/solving all work-related problems.

Arrangements should be made for periodic assess[ment] of apprentice performance. The apprenticeship superv[isor] initially should rate the competency of the apprentice [on] every activity in the work process description using [the] five-point scale. A meeting should be arranged with [the] apprentice to provide him/her an opportunity to [rate] his/her own performance using the same scale. Comp[aring] the apprentice's self-rating with the supervisor's ratin[g will] determine areas of discrepancy.

It is recommended that an apprentice, in conjunc[tion] with the supervisor, work out a plan by which [the] apprentice develops competencies in specified w[ork] areas. This plan may be very informal and consist of [little] more than an agreement between the apprentice and [the] supervisor as to the work activities on which the appren[tice] will concentrate and an approximate date for attainmen[t of] that competency. A more formalized plan might iden[tify] specific work activities on which the apprentice intend[s to] concentrate, describe learning activities, and specify ta[rget] dates.

apprentice on which to record progress. Note supervisor ratings beside each work activity with the date of the rating. The personalized work process description is a record of individual performance.

Ratings can be used to determine the rate of apprentice progress towards attainment of that particular competency. A personalized work process sheet can also be used to keep a running record of the actual hours that each apprentice has logged in towards obtaining competency for that particular work activity. By comparing the number of hours actually expended with the number of hours allocated and the progress towards competency attainment, the supervisor has a valuable tool to use in the appraisal of apprenticeship progress. A formalization of the work process descriptions as a recordkeeping device for apprentices can be used to constitute the standard.

Supervisory Ratio

The number of apprentices to be supervised by each journeyman should be specified as a program standard. The standard insures that the apprentice/journeyman ratio does not become too large so as to preclude efficient supervision. A general rule of thumb in principles of management is that the span of control should not exceed seven to nine. Translated to apprenticeship training, this would mean that ideally no journeyman should supervise more than seven to nine apprentices, unless unusual circumstances are present. In practice, given that journeymen must supervise *and* train apprentices, probably five apprentices per journeyman is a sufficient number. Remember, because apprentices move from work station to work station across the apprenticeship term, each apprentice will (and should) work with a number of different journeymen.

Qualification For Apprenticeship

Standards should be prescribed that indicate admission requirements. To the extent possible, admission requirements should be based on objective evidence that the requirements are related to performance in the apprentice program. The motivation and physical abilities identified in the previous chapter provide an ideal source for admission requirements. Recall that the Analysis Committee specified all physical activities that required exces-

an objective rationale for the deter—
standards. Admission standards
minimum age. As a general rule, ap—
ranges from sixteen to eighteen.

Equal Opportu

Equal access to training oppor—
priority and is important to ensure t
opportunity to apply. Apprentices
incorporate into their standards st
that the recruitment, selection, em
of apprentices shall be done witho
race, color, religion, national origin
Code of Federal Regulations — Part
Consult it as a basis for formulating
equality of opportunity and access.
tion from the Department of la
outreach and expansion programs
models.

Apprenticeship A

A central distinguishing feature o
of training is that there is a legal ag
sponsor and the apprentice. This le
provide for:

- The name of the apprentice;
- Address of the apprentice;
- Signature of parent or guardia
- Name of employer and addre
- Signature of authorized comp
- Provision for approval by the
  mittee;
- Provision for sign up by re
  registered);
- Title of apprenticeable occup
- Probationary period;
- Term of the apprenticeship;
- Credit for previous experienc
- Date apprenticeship begins;
- Term remaining;
- Biographical information on
  ethnic group, highest educati
- inclusion of standards pertain

some instances, the apprentice is indentured directly to an ... a joint apprenticeship council rather than an employer ... hence, the contract is between the apprentice council ... the apprentice.

It is recommended that a standardized legal contract ... be drawn up and used for all apprentices in the ... program. This apprenticeship form then becomes a stand- ... for the apprenticeship program. Since the contract is a ... al document, services of a lawyer to review the legality ... the proposed form is advisable unless a standardized ... tract form designed by the State Apprenticeship Agency ... BAT is used.

Credit For Previous Experience

Procedures should be developed that provide for credit ... apprentices for competencies gained from previous ... perience. Allocation of credit for previous experience ... uld be based upon a review and assessment of work ... vities, using the rating scale as previously described.

One way to determine credit for previous work ex- ... ience is to assign percentages for each scale value. For ... mple, you might provide 25% credit for a rating of 1, ... % credit for a rating of 2, 75% credit for a rating of 3, and ... % credit for a rating of 4. Thus, an apprentice who ... ms a competency in a particular area can ask for and ... eive a performance rating. Based on the rating, a portion ... nstructional credit will be granted. Other schemes for ... or credit include credit for prior training experiences, ... dit for prior supervised work experience, and credit ... ed on results of performance tests such as the National ... cupational Competency Tests. Remember, the more ... llicit you are about the competencies required of a ... rneyman and the more highly developed your testing ... gram, the easier it is to determine the value of prior ... perience. Also, remember that in some programs, prior ... dit is withheld until the probationary period is passed. ... e procedure, once formalized, should be constituted ... nally as a program standard.

Wage Schedule

Provision for a progressive wage based upon progress ... ough the apprenticeship program should be included ... a program standard. Wage progression arrangements ... vary from advancement based on time in the program

Recognition For Completion

Apprentices should receive formal recognition for co ... pletion of the program. Recognition may take the form ... certificate or diploma signed by the appropriate offic ... The certificate attests to apprentices having completed ... program training requirements. Make certain that ... certificate or diploma has an official look, that it is sign ... by the appropriate official and that it attests to the fact t ... the named apprentice did in fact complete all progr ... requirements. Often it is useful to record the w ... activities that the apprentice is capable of performing. T ... work process description can be printed on the certific ... or as an attachment. Work process descriptions, if ... cluded, should be signed by appropriate officials sign ... ing that the apprentice has demonstrated competencie ... the areas so indicated.

Union/Management Cooperation

In those areas covered by collective bargaining agr ... ments, provisions should be made for including un ... representation in all areas of apprenticeship progr ... standards. The specified procedures by which un ... contributions are incorporated into the design of ... training program should be included as a formal standa

How To Establish Goals And Objectives

A *goal* is a results-oriented statement of intent. Goals ... written and provide a general description of an outco ... selected to satisfy an individual sponsor or commun ... need. Goal statements clearly designate the desired o ... come to be attained as well as who will benefit from ... attainment of this outcome. Possible outcomes from ... apprenticeship program include:

- Provide a pool of trained craft workers to m ... present and future sponsor/employment requ ... ments;
- Assure a supply of skilled workers that will supp ... community economic development expectation
- Provide increased quality of goods and serv ... produced;
- Increase worker productivity;
- Provide workers a greater degree of job security ... comes from having a skilled trade or craft that i

Verbs Commonly Used With Goals

crease	decrease
pand	reduce
hance	diminish
velop	lessen
prove	shorten
qualize	curtail

Formulation of goal statements requires that expected outcomes be linked with specific target groups. Target groups with special relevance for apprenticeship programs clude:

- Apprentices of all types including adults, youth, women, minorities, veterans;
- Business and industry
  - Organizational divisions within a specified firm;
  - Sponsoring business firms and organizations;
- Unions
- Local community
  - Employer groups and/or associations;
  - Community residents;
  - Local businesses dependent upon community prosperity;
  - Local economic development.

Example Of A Typical Goal Statement

o improve The Recruitment **of** Young Women into The Apprenticeship Program

Outcome   *Target Group*

An *objective* is a detailed and specified description of an outcome. Usually it is written and describes the intended results and objectives in measurable terms. There may be several objectives for each goal. Usually good planning specifies no more than three or four objectives for each goal. Objectives are the means for the achievement of apprenticeship program goals. The fact that objectives focus on means rather than final outcomes provides the basic distinction between goals and objectives.

Objectives should state: (a) what action is to be taken to achieve the goal; (b) what measurable results are to be anticipated to be achieved by the action; and (c) within that time period the results are to occur.

To illustrate how objectives differ from goals, consider the goal: *to increase the versatility of skills necessary to*

used in the apprenticeable occupation;

- To review within the next eight months the v processes descriptions in light of change in t nological requirements;
- To revise by the end of the calendar year the v processes descriptions to reflect changing techno cal conditions.

Objectives should begin with strong action-orie verbs that describe an observable or measurable beha The following list illustrates the broad range of prog actions that are supportive of goal attainment.

Verbs Commonly Used With Objectives

design	implement
prepare	place
involve	serve
inform	support
offer	encourage
provide	enable
stimulate	communicate
review	coordinate

Goals and objectives can be formulated according five-step process. Each step represents a set of activ that should be performed in logical order.

Step 1: Assign Responsibility To A Designated Group

Responsibility for formulating goals and objec should be assigned to a specific group. The most rea able assignment of responsibility would be to tho prenticeship Committee which has responsibility for all program planning. Goals/objectives formulation necessary part of planning responsibilities.

Step 2: Secure And Utilize Necessary Supportive Information

In order to insure that goals/objectives are based on available evidence, data from a number of sources sh be assembled and utilized by the Apprenticeship C mittee in the goal/objective formulation process. should be obtained from the following sources:

- Program standards;
- Skills Knowledge Analysis Sheets;
- Motivation and Physical Requirements Ana Sheets;
- Sponsor expectations as to program results;

- Descriptive information of similar programs con-
  ducted in other localities;
- Available information from State Apprenticeship
  Agency and/or BAT representative;
- Union expectations as to program outcomes;
- Data from local employers indicating need for
  apprenticeship program;
- Statements of support from community leaders;
- Standards prepared by National Apprenticeship Com-
  mittee;
- Relevant Department of Labor materials.

p 3: Identify The Target Groups To Be Served By The Apprenticeship Program And The Specific Needs Of The Group Filled By The Program

For each identified target group, specific needs may be
veloped by the Apprenticeship Committee, either as a
oup or individually. When all the needs have been
entified, then the group can turn to the separate
cussion of each identified need. Choose a particular
ocedure based upon the individual styles and pre-
ences of committee members.

p 4: Define The Apprenticeship Program Outcomes The Best Serve Identified Target Group Needs

Once the needs of various target groups have been
entified, identify the program outcomes considered to
isfy these needs. As a general rule, specify no more than
o or three outcomes for each identified need. Outcomes
y be solicited formally from each Apprentice Com-
tee member or generated from free group discussion.
the case of disagreement between Committee mem-
s, try to secure agreement on the suitability, practicality
I general intent of the outcome statements. Retain only
ose outcome statements for further consideration on
ich consensus is obtained.

p 5: Formulate Objectives For Each Goal

Once outcomes have been defined, they can be trans-
ed into goal statements by linking outcomes with
responding target groups. Then objectives should be
mulated for each goal. The Apprenticeship Committee
st insure that objectives are measurable and specified.
ther, objectives must serve the goals formulated in
ps Three and Four. Each objective should state only a
gle aim or purpose and should specify a single end
oduct or result within a specified time frame.

metal mechanics apprenticeship program serving five l
employers. The Apprenticeship Committee consists of
personnel and/or training directors representing the
sponsoring firms. During the early stages of planning
program the Apprenticeship Committee has met freque
to discuss the major purposes to be accomplished by
program and to set the program standards that will serv
guide program administration. One area that Bob And
son, the ABC Company Personnel Director, was particula
interested in dealt with evaluation of apprentices
progress and recordkeeping. He was personally convinc
that knowledge of apprenticeship progress should
made available to the individual apprentices and used
motivate their performance. He was further concerned t
the assessment of apprenticeship performance should
be regarded as a test with negative consequences if o
failed, but rather as a verification that the apprentice h
indeed advanced to another plateau of competency.
also was firmly convinced that apprentices should be giv
much of the responsibility for their own learning. He w
successful in persuading other Committee members
accept this view and to design a rating and record
system that incorporated this philosophy.

The assessment system designed by the Commit
provides for a large amount of interaction between
supervisor and the apprentice in the evaluation proce
Upon entry into the apprenticeship program, the syst
provides for apprentices to rate the level of their co
petency on each of the work activities in the work proc
description. Some Committee members initially rais
questions about the wisdom of allowing apprentices
rate their competencies. The argument in support of s
ratings was that the self-rating exercise would expose
apprentice to the range of work activities for wh
competence was required as well as focus the apprentic
attention on the assessment of their present skills lev
Rather than tending to overrate themselves as some l
members feared, the consensus of Committee opinion
that the apprentices would be realistic in their s
appraisal and, if anything, would tend to be conservative
their self-appraisal.

Upon completion of the initial self-rating, the des
calls for the apprentice and his/her supervisor to meet
to discuss the self-ratings. The supervisor's role is to ass
the apprentice in terms of formal qualifications a
observations of performance and to interpret the
prentice's self-rating against the supervisor's perceptio
The result of this meeting is consensus between

prentice agree upon certain work activities that
...ntice will concentrate upon in the near future.
...k activities are identified, bearing in mind the
...of activities to be learned as identified in the
...esses. Approximate dates for moving to the next
...y level on the rating scale are identified and
...on in principle by both the apprentice and the
.... This informal contract is expected to make
...rete the learning expectations of the apprentice
... future. Also, it provides the apprentice a goal on
...concentrate his/her activities. From the stand-
...e supervisor, it provides a rationale for work
...t that contributes to apprentice growth.
...oosed system also provides for an assessment of
...s' skills when the apprentice feels that he or she
...r that assessment. This raised some questions
...some Committee members who were doubtful
...value of allowing apprentices to determine
...r performance should be rated. The counter
...was that continual assessment on demand
...pprentice responsibility for directing the rate of
...d requires more self-autonomy with corres-
...motivational value. Once the apprentice deter-
...he or she has mastered the work activity, a
...be formally rated is made to the supervisor. The
...has the prerogative to refuse this request if there
...o believe that the apprentice is obviously not
...supervisor rates the apprentice using a com-
...accumulated evidence gained from continual
...of the apprentice at the work station and of the
...specific piece of work that was agreed upon to
...a job sample. Concentration upon a specific
...work allows the supervisor to use specific
...o support his rating.

Additional Information

...re information on developing goals and ob-
...u could refer to the following:

...es. *Education and Training for Older Persons:*
...*am Guide.* Washington, D.C.: U.S. Government
...Office, 1981.

Answer the following questions in the space provided or ...
separate work paper. Compare your answers with th...
provided in the appendix of this booklet.

1. Describe the purpose served by apprenticesh...
   standards.

2. List the topics that should be covered by apprentic...
   ship program standards.

3. The Tri-Town Area Apprenticeship Council has ...
   quested assistance in determining standards regar...
   ing related Instruction. What procedure for constru...
   ing these standards would you recommend.

4. How do goals and objectives differ?

5. Suppose that you were called upon to devel...
   objectives for an apprentice program. What crite...
   would you use in writing objectives?

4. Skill: Incorporate Ideas That Facilitate Upgrading Of Program To Keep Current With New Technology, New Training Ideas And Changes Occurring In The Occupation

Introduction And Objectives

Change is a way of life. Although always present, it is now more than ever important to be able to adapt to the pace of new technology. The information revolution has replaced the industrial revolution and no one is isolated from its effects. The age of electronics and progress in micro-chip technology is altering our lives. The computer is expanding our capacities at an explosive rate and is changing the way work is performed. This change cannot be ignored by those programs that develop the trades and crafts skills that make our standard of living possible. To be more responsive to the changing demands of technology presents a continuing challenge to apprentice training. As you work through the material in this unit, you must strive to sharpen your awareness about the nature and direction of technological change and its implications for apprenticeship training. When you complete this unit, you should have the competencies to:

1. Locate one or more new technologies likely to change occupational skills requirements;
2. Critique and identify new technology to determine skills implications;
3. Revise work processes to account for changing skills requirements;

Why Be Concerned With Technological Change?

Technology is changing at an explosive and, to some, an alarming rate. We stand on the threshold of an Information revolution that likely will surpass in magnitude the developments accomplished during the industrial revolution. Tiny micro-chips that can rest on the head of a pin have made possible the development of desk-sized micro-processors that accomplish what a room full of computers did only a few short years ago. Light, when properly used, can be used to cut metal. Computer controlled

productivity and to maintain a competitive position in world markets.

Technological change influences work in varied and changing ways. In some instances, existing skills will become obsolete. In others, the technology will upgrade existing skills by placing an increasing premium upon diagnostic and problem-solving capability or by requiring new skills in order to work with new materials, machines or processes. Whereas technology may eliminate some jobs, it will create others. Although the exact impact of technology is difficult to predict, it certainly will influence to some degree most apprenticeable occupations. The anticipation of forthcoming technological changes and the modification of apprenticeship programs to accommodate to these changes is the responsibility of good program planning.

How To Keep Apprenticeship Programs Current

Technology seldom changes abruptly enough to render an occupation totally obsolete. What happens instead is that over a period of time, the occupation changes to accommodate the skills required by the technology. The rate of that change depends upon the speed at which the technology is adopted. If apprenticeshp training is to be a viable training mode, it must produce journeymen with the skills demanded by the current state of technology. To do otherwise runs the risk of preparing people whose skills are obsolete and their resources wasted in terms of potential benefit to society.

Updating apprenticeship programs to insure that they are in accord with current technological requirements is a three-step process. New and changing technolgical demands first must be identifed. Once identified, the implication of these technological changes with respect to skills training can be assessed. The capabilities of existing apprenticeship programs to produce competencies in

Step 1: Identify New Technologies That Likely Will Impact On The Occupation

This task requires knowledge of the state-of-the-art technologies that soon will be available in the marketplace and are expected to influence current craft skill requirements. These technologies may be incorporated in new machinery and equipment, materials, tools, or changes in marketing, sales, distribution or manufacturing processes that can be expected to influence the apprenticeable occupation. Locating these technologies requires the development of an intelligence network that provides information as to forthcoming changes in products and procedures. Important sources for information about anticipated technological changes include:

- Trade publications;
- Manufacturing sales representatives;
- Trade associations;
- Universities and community colleges (especially those that have an extension service);
- Newsletters that specialize in new technology identification;
- Consultants;
- Other industry representatives.

This information should be systematically collected and periodically reviewed to determine its implications for the apprenticeable occupation. The review should concentrate upon determining whether the technology is currently available in the marketplace, and what would be the likely rate and scope of its use by business and industry. Determination of use frequently will involve assessment of the likelihood that one of several available prototypes ultimately will become the industry standard.

The Apprenticeship Committee should bear the central responsibility for reviewing the technological scene and for determining which technologies have the greatest likelihood of changing the skill requirements in apprenticeable occupations. The committee must decide the extent to which new technologies will have a direct influence on the shop floor. If the technology appears destined for use by the industry, then it is the responsibility of the apprenticeship program to incorporate this change into its training plan.

Step 2: Assess Impact On Training Requirements

Once a technology has been identified as having the

Product descriptions should be carefully reviewed and areas of change pinpointed. These areas of change must scrutinized to determine whether existing skills will suffice or whether new skills will be required. In some instances, the technological change will require only that the craftsperson have knowledge of the properties of a material or a minor modification of an existing process. In other instances, the technology will alter completely the nature and sequence of the work activities and will require the learning of new skills. Electronic components a particular case in point. If the electronic components modularized and repair is simply replacement with another like unit, then the impact of the technology relatively minor. If, on the other hand, repair does involve interchangeable units and must be performed on site, then the skills impact of the technology could considerable. Such characteristics of new technology must be carefully reviewed to determine skills impact.

For each technology that has been identified to impact the occupation in question, a description of the worker skills requirements should be prepared. Worker skills analysis should describe the worker skills in terms of:

- Information to be processed;
- Operational processes;
- Repair skills;
- Routine maintenance skills;
- Problem-solving skills; and
- Changes in organization of work that would alter people-related skills.

The apprenticeship committee should document the findings. Documentation should be organized according to major skills areas. This documentation may be formal, in the case of a report or informally presented as a discussion document. The important point is that an adequate attempt be made to determine the implications that the new technology will have for craft skills.

Step 3: Update Apprenticeship Program To Take Into Account Anticipated Skills Requirements Due to Changing Technology

The results of the skills analyses performed in Step 2 should be used as a criteria to assess the adequacy of the existing training program. Compare the work activities and their associated knowledges against the skills required by the new technology. Review existing work activities

asis on other skills be reduced while keeping
er of total hours constant or must additional hours be
?

decision about whether the skills should be
oped, whether on the job or in related instruction,
ust be reconsidered. If assigned to related instruc-
he impact on the total number of apprenticeship
assigned to related instruction must be reevaluated.
h changes will affect program standards. Make the
explicit by revising standards accordingly. Only
gh the development of such a procedure for systema-
determining the effects of technological change can
prenticeship program be considered truly respon-
the apprentice, the sponsor, the community and

Example

Clover Manufacturing Company sponsors an ap-
eship program for machinists. The company, as part
ajor capitalization effort, has been considering the
ition of computer-controlled milling machines. The
nanager, the production engineer, and the purchas-
nt have been investigating the market with respect
peting manufacturers. In the course of their delibera-
they have collected information about computer-
lled milling machines and their capabilities.

ng heard about the interest in moving from numeric
nputer control, Sandy Dickerson, Chairperson of the
nticeshp Committee, approached management with
ncern about the implications for the apprenticeship
m. Management concurred that conversion might
uce a problem and encouraged her to assess the
ations for the apprenticeship program. They made
ole for study all written information about equip-
options.

Apprentice Committee conducted a detailed study
matter beginning with a review of available informa-
ventually a decision was made by company manage-
to purchase equipment from a particular manu-
r. The sales reprsentative was requested to provide
c information to the Apprenticeship Committee. As
growth of their analyses, the Committee determined
e only significant change seemed to be in the use of
croprocessor to control milling machine operations.
esult of their investigation, they came up with the
ing new work activity: "Must be able to input

---

of the apprenticeship program since the minimum to
judged to be learned on the job, there was no implica
for standards pertaining to related instruction. No o
changes in apprenticeship program standards were
quired. With this modification, the Apprenticeship C
mittee felt confident that their program was responsiv
state-of-the-art technology demands.

Additional Information

You may also refer to the following related sources

- D.W. Drewes. *Working for America: A Worker-Cente
  Approach to Productivity Improvement*. Raleigh,
  CONSERVA, inc., September 1982.
- D.W. Drewes. *Vocational Education: Its Role in Produ
  vity Improvement and Technological Innovatio
  Raleigh, NC: CONSERVA, inc., September 1982.
- J.A. Jaffe, E.H. Oglesby and D.W. Drewes, eds. *Technolo
  of the '80s: Their Impact on Trade and Indus
  Occupations*. Raleigh, NC: CONSERVA, Inc., Septem
  1982.

Self-Test Exercises

*Answer the following problems in the space provided o
separate work paper. Compare your answers with th
provided in the Appendix at the back of the booklet.*

1. Indicate how you would go about locating n
   technologies that are likely to change occupatio
   skills requirements.

2. Outline a procedure for assessing the implication
   new technology with respect to skills training.

3. Describe a procedure for revising the work activi
   and associated knowledge to reflect changing s
   demands.

5. Appendix

1: Conduct Occupational Analyses To Determine Need For, Support For And General Content Of The Program

Method	*For*	*Against*
Formal employee survey	Comprehensive coverage	Time consuming
	More accurate results	Costly
Informal employer survey	Faster	May be biased
	Requires less effort than survey	Limited coverage
Secondary data from other source	Easy to acquire	May not be available
	Data collected by 'experts'	Data may be outdated
		May not apply to local conditions

eps for support building should include:

. Document shortage of craft/trade skill.

. Identify potential sponsors (employers and/or unions) affected by skills shortage.

. Draw up a list of benefits of apprenticeship training.

. Anticipate arguments against apprenticeship training.

. Show potential sponsor(s) that potential benefits from an apprenticeship program can be expected to exceed anticipated costs.

. *Single Employee*   Single firm provides major employment opportunities for craft/trade

b. *Group of Employees*   Skills shortages experienced by multiple employees

c. *Labor Organization*   Union has historically assumed responsibility for craft training

d. *Combination*   Collective bargaining agreement between management and labor

4. a. Form an Analysis Committee
   b. Appoint a Chairperson
   c. Convene committee
   d. Instruct committee as to purpose
   e. Identify major work categories
   f. For each major work category, define work activities
   g. Order work activities according to order of learning
   h. Record major work categories and associated work activities ordered according to learning priority.

5. h. and e. Both statements refer to required knowledges (familiarity and understanding) rather than actual job behavior.

6. You should consider the following elements:

   a. Identify and describe types of people required to be dealt with in the course of performing the job.

   b. Define the job skills required to deal with the people identified.

   c. List the major knowledge areas that are necessary in order to exhibit the job skills defined in b.

   d. For each major knowledge area identified in c. provide a more specific description of the knowledge(s) required.

I.I.: Establish Goals And Objectives For The Apprenticeship Program

a. Describe structure of the program.
b. Communicate program procedures.
c. Serve as guidelines for program administration.

a. *Training Standards*

Work Processes
Related Instruction
Safety and Health Training
Terms of Apprenticeship
Probationary Period
Program Evaluation Records
Supervisory Ratio

Administrative Standards

Qualifications for Apprenticeship
Equal Opportunity
Apprenticeship Agreement
Credit for Previous Experience
Wage Schedule
Recognition for Completion

In developing related Instruction standards, you should:

a. Review the skills-knowledge analysis sheets
b. Identify knowledge and understandings that

- Deal with basic theory and principles
- Cannot be expected to direct observation and/or on-the-job experience

- Are crucial to job performance but occur infrequently that they are not likely to learned on the job
- Require charts, graphs, and other supplemental material to assist learning
- Will profit from group discussion and problem solving

c. Assign a number of contact hours considered necessary to master each knowledge and skill

d. Total the number of hours of related instruction and compare with total number of hours located to the apprenticeship program.

4. *Goals* are general statements of program intent stated in terms of a target group to be served and a desired outcome for that target group.

Objectives are specific statements as to how the goals will be attained in terms of actions to be taken, measurable results to be achieved and the timeframe allowed.

5. Objectives should:

a. Be worthwhile and significant
b. Be realistically achievable
c. Describe appropriate strategies for goal attainment
d. Indicate numbers served, performance to attained or other measurable results
e. Be precisely stated to insure understanding.

4. SKILL: *Incorporate Ideas That Facilitate Upgrading of Program To Keep Current With New Technology, New Training Ideas And Changes Occurring In The Program*

1. Gather knowledge about technological changes from a variety of sources including:

   a. Trade publications
   b. Manufacturers' representatives
   c. Universities/community colleges
   d. Trade associations
   e. Consultants
   f. Knowledgeable company personnel
   g. Local businesses and industry with similar craft/ trade requirements.

2. a. Identify nature of technological change in terms of

   · equipment/machines
   · operational processes
   · materials
   · tools
   · work setting

   b. For each area of change identified in (a), analyze the impact on job skills with respect to

   · operational skills
   · repair skills
   · problem-solving, diagnostic or trouble-shooting skills
   · data collection and analysis skills
   · people-related skills

· operational procedures
· maintenance procedures
· repair procedures
· troubleshooting procedures
· safety procedures
· materials handling
· basic theory

3. a. For each new knowledge requirement, existing work activities and knowledges, select those that come closest to meeting new requirements;

   b. To the extent possible, modify existing knowledges to incorporate new requirements;

   c. For those instances where no similar knowledge existed, add the new knowledge to the apprentice program content.

   d. Determine whether the new knowledge can be gained through on-the-job or related instruction;

   e. If on-the-job, modify the work activities to provide opportunity for mastery of new skills;

   f. If the new knowledge is to be gained through related instruction, modify the structured related instruction accordingly.

Which of the following is *not* a direct responsibility of an apprenticeship committee?

a. Development of selection standards

h. Assessment of individual apprentice performance

c. Establishment of training curriculum

d. Certification of completion

Classification of work activities by major activity areas is termed _____ .

The most direct indicator of need for an apprenticeship program is:

a. shortage of skilled craft/trade workers.

b. lack of existing training systems.

c. employer support.

d. increased applicant interest.

in developing work activities, statements such as "Apprentice must be familiar with ..." or "Apprentice must be aware of . . ." should be avoided because _____

The analysis sheets used to analyze an occupation are organized according to three major dimensions. Name the three occupational dimensions.

a. _____   b. _____   c. _____

The purpose of the occupational analysis sheets is to:

a. identify job skills.

b. determine equipment needs.

c. specify worker skills and knowledges

d. all of the above.

Apprenticeship program goals should contain a clear statement of
(a) _____ and (b) _____ .

Apprentice program standards are useful because they describe (check all that apply)

a. the content of the program.

b. expected program results.

c. the way the program is organized.

d. the rules governing program operation.

e. strategies for the attainment of program goals.

Describe the criteria to be used in deciding whether knowledges and skills should be learned on the job.

a.

b.

c.

c.

11. Identify the three procedural steps for determining the effects of technological change on apprenticeship prog

    a.

    b.

    c.